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Ion beam driven HEDP experiments on NDCX*

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Abstract

Intense beams of heavy ions are capable of delivering precise and uniform beam energy deposition, with the capability to heat volumetric samples of any solid-phase target material to high energy density. The WDM conditions are achieved by combined longitudinal and transverse space-charge neutralized drift compression of the ion beam to provide a hot spot on the target with a beam spot size of about 1 mm. Initial experiments use a 0.3 MeV, 30-mA K^+ beam from the NDCX-I accelerator to heat foil targets such as Au, Pt, W, Al and Si. The NDCX-1 beam contains a low-intensity uncompressed pulse up to >10 μs of intensity ~0.4 MW/cm^2, and a high-intensity compressed pulse (FWHM 2-3 ns and fluence ~4 mJ). WDM experiments heat targets by both the compressed and uncompressed parts of the NDCX-I beam, and explore measurement of temperature, droplet formation and other target parameters. Future plans include target experiments using the NDCX-II accelerator, which is designed to heat targets at the Bragg peak using a 2-3 MeV lithium ion beam.

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